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Adaina jobimi sp. nov., a plume moth (Lepidoptera, Pterophoridae) associated with *Baccharis alnifolia* (Asteraceae) in the Andes of northern Chile

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Abstract. The adult stage of the plume moth *Adaina jobimi* **sp. nov.** (Lepidoptera: Pterophoridae: Pterophorinae: Oidaematophorini) from the arid highlands of the western slopes of the Andes of northern Chile is described and illustrated. The wing pattern and genitalia of *A. jobimi* resemble those of *A. excreta* Meyrick, 1930, from Argentina, Ecuador and Peru and *A. coquimboae* Gielis, 2012, the only representative of the genus previously known from Chile. Morphological differences of *A. jobimi* with these two congenerics are discussed. Larval feeding and pupation of *A. jobimi* occur on inflorescences of the native shrub *Baccharis alnifolia* Meyen & Walp. (Asteraceae). The discovery of *A. jobimi* provides the first record of the genus in a long distribution gap in mainland South America west of the Andes Range, suggesting that the taxonomic diversity of *Adaina* in this area deserves further attention.

Introduction

Adaina Tutt, 1905 (Lepidoptera: Pterophoridae: Pterophorinae: Oidaematophorini) is a mainly New World genus of plume moths also represented in the Afrotropical, Australian, Oriental and Palearctic regions (Gielis 2003). The genus includes 38 described species, 30 of which are known from the Neotropical Region (Gielis 2003, 2011a, 2011b, 2012, 2013, 2014). Geographic records of *Adaina* from mainland South America are mostly from east of the Andes (Gielis 2011a, 2012, 2013, 2014), whereas a long distributional gap of the genus is found west of the Andes between Ecuador and central Chile. Larvae of *Adaina* can feed on leaves, flowers or induce galls on their hosts (Matthews 2006). Confirmed host plant records are restricted to Asteraceae (Landry et al. 2004; Matthews and Lott 2005).

The endemic *Adaina coquimboae* Gielis, 2012, whose geographic range is restricted to the lowlands of the north-central part of Chile, is the only representative of the genus currently known from this country (Gielis 2012). The aim of this study is to describe a new species of *Adaina* recently discovered in the arid highlands of the western slopes of the Andes of the northernmost part of Chile.

Material and methods

Florivorous larvae were found within inflorescences of the native shrub *Baccharis alnifolia* Meyen & Walp. (Asteraceae) in March 2018 about 2 km south of Socoroma village (18°27’22”S,

69°35'15"W), Parinacota Province, northern Chile, at about 3400 m elevation on the western slopes of the Andes. The climate of the site is tropical xeric, with seasonal rains concentrated mainly in summer (Luebert and Pliscoff 2006). The infested inflorescences were collected and placed in plastic vials with paper towel at the bottom. The vials were brought to the laboratory and additional inflorescences were provided if necessary before pupation. The emerged adults were mounted following standard procedures. The abdomen of each was removed and placed in hot 10% KOH for a few minutes for genitalia dissection. Eosin Y or Chlorazol Black were used to stain the genitalia and Euparal was used for mounting the genitalia on slides. Photographs were taken with a Sony CyberShot DSC-HX200V digital camera attached to a Leica M125 stereomicroscope. The distribution map was generated using SimpleMappr (Shorthouse 2010).

Abbreviations of institutional collections

MNNC Museo Nacional de Historia Natural de Santiago, Santiago, Chile
IDEA Colección Entomológica de la Universidad de Tarapacá, Arica, Chile

Results

Adaina jobimi sp. nov.

http://zoobank.org/B1FB4445-979C-4C15-9D1D-E18D6C1E2412

Figs 1–12

Type material. ***Holotype***, male, CHILE: Socoroma, Parinacota, Chile; emerged April 2018; H.A. Vargas leg.; ex-larva inflorescence *Baccharis alnifolia*; March 2018; genitalia slide HAV-1389 (specimen and genitalia slide deposited at MNNC).

Paratypes, CHILE. Three males (genitalia slides HAV-1142, HAV-1385, HAV-1387), one female (genitalia slide HAV-1386), same data as for holotype (specimens and genitalia slides deposited at IDEA).

Type locality. About 2 km south of Socoroma village (18°27'22"S, 69°35'15"W), Parinacota Province, northern Chile, at about 3400 m elevation on the western slopes of the Andes.

Diagnosis. *Adaina jobimi* resembles the Neotropical *Adaina excreta* Meyrick, 1930, described from Peru, also known from Argentina and Ecuador. However, the two species can be separated accurately based on genitalia morphology. In the male, *A. jobimi* has the saccular spine of the left valva almost straight along the medial third with the distal third curved towards the costa, a small saccular process on the right valva, juxta narrower dorsally, right arm of the anellus triangular, tip of phallus slightly swollen dorsally and vesica with a V-shaped cornutus, while *A. excreta* has a waved saccular process on the left valva, lacks a saccular process on the right valva, the juxta is almost parallel-sided, the right arm of the anellus is curved, the phallus tip is acute and the cornutus is plate-like. In *A. jobimi* females, the ostium bursae displaced to left and the laterally more thickly sclerotized antrum differ from *A. excreta* in which the ostium bursae is centrally positioned and the antrum is tridentate. *Adaina jobimi* can also be separated accurately from the only other representative of the genus in Chile, *A. coquimboae*. The dark brown spot at base of the cleft is small, not well-defined in *A. jobimi*, while this spot is distinct and larger in *A. coquimboae*. In the male genitalia, the distally curved saccular spine and the V-shaped cornutus of *A. jobimi* differ from the straight saccular spine and absence of a cornutus in *A. coquimboae*. In the female genitalia, *A. jobimi* has an inwardly curved anterior apophysis and parallel-sided antrum, while *A. coquimboae* has a blunt anterior apophysis and gradually narrowing antrum.

Figures 1–6. Adult stage of *Adaina jobimi* sp. nov. **1.** Holotype male in dorsal view. **2.** Male genitalia, phallus removed. **3.** Phallus. **4.** Saccular process of left valva (square in Fig. 2). **5.** Distal portion of the phallus (rectangle in Fig. 3). **6.** Female genitalia; apex of the posterior apophyses broken; only the basal part of the ductus seminalis shown; open arrow indicates limit between ductus bursae and corpus bursae. Scale bars: 1, 0.1, 0.1, 0.1 mm, respectively.

Figures 7–11. Natural history of *Adaina jobimi* sp. nov. **7.** Habitat at the type locality. **8.** The host plant, *Baccharis alnifolia* (Asteraceae). **9.** Larva shortly before pupation. **10.** Dorsal view of pupa. **11.** Lateral view of pupal exuvium.

Male (Fig. 1). Forewing length 6.8–7.2 mm.

Head. Vertex yellowish brown, appressedly scaled. Frons grayish brown, appressedly scaled. Occiput yellowish brown, narrow erect scales. Labial palpus porrect, yellowish brown; first segment with flat, erect scales, slightly projected below the compound eye; second and third segments with appressed scales. Antenna filiform, yellowish brown dorsally, short cilia ventrally.

Thorax. Yellowish brown, scales appressed. Foreleg yellowish brown, coxa with a wide dark brown longitudinal stripe, femur with two narrow dark brown longitudinal stripes, tibia with a wide dark brown longitudinal stripe, tarsus grayish brown, first tarsomere with a narrow dark brown longitudinal stripe. Midleg yellowish brown, two and one narrow dark brown longitudinal stripes on femur and tibia, respectively, tibial spurs grayish brown, tarsus grayish brown. Hindleg yellowish brown, tibial spurs grayish brown, proximal pair with medial spur slightly

longer than lateral one. Forewing dorsum mainly yellowish brown; a small, not well-defined dark brown spot at base of cleft; first lobe with a longitudinal dark brown costal spot at about 1/3 from cleft base to apex, a small dark brown spot at apex and a small dark brown spot at about 2/3 on the anal margin, fringe yellowish brown; second lobe with a small dark brown spot at apex and a few small, not well-defined dark brown spots along the anal margin, fringe yellowish brown. Forewing venter mainly dark brown, changing to yellowish brown on first lobe. Hindwing dorsum grayish brown; fringe yellowish brown. Hindwing venter dark brown. Venous scales dark brown.

Abdomen. Yellowish brown with few scattered grayish brown and dark brown scales.

Male genitalia **(Figs 2–5).** Tegumen bilobed, with distinct sclerotized median sulcus; anterior margin with narrow, rounded projection medially. Uncus narrow, slender, curved, pointed apex, about as long as tegumen. Vinculum narrow. Saccus slightly curved posteriad. Juxta asymmetrical, curved to right, narrower dorsally. Anellus arms asymmetrical; left arm finger-like, slightly swollen near apex with a few short setae and a small apical spine; right arm triangular, slightly longer than left arm, with a few small setae near apex and a small apical spine. Valvae asymmetrical, with a group of long, hair-like scales basally on external side of each valva. Left valva wider than right valva; costal sclerotized band narrow, not reaching apex; apex rounded; saccular process consisting of a well-developed, somewhat bean-shaped basal section with a short triangular cleft and a slender saccular spine; basal third of saccular spine rounded toward ventral margin of valva, medial third almost straight, apically oriented, distal third curved toward costa. Right valva narrower than left valva, costal sclerotized band narrow, not reaching apex; apex rounded; with a small saccular process from a narrow cleft slightly distal to the middle of dorsal margin of sacculus. Phallus cylindrical, curved, tip slightly swollen dorsally, with V-shaped cornutus on vesica.

Female. Similar to male in size and colouration.

Female genitalia **(Fig. 6).** Papilla analis short, posteriorly rounded, slightly sclerotized, with few short setae. Posterior apophysis (apex of the two posterior apophyses broken during mounting of the only female available for study), narrow, rod-shaped, about four times the length of the papilla analis, apex (when not broken) almost reaches the anterior margin of tergum VIII. Anterior apophysis from anterior vertex of tergum VIII, triangular, slightly shorter than papilla analis, apex inwardly curved, not bifurcate; anterior margin of tergum VIII between anterior apophyses straight. Ostium bursae displaced to left. Antrum parallel-sided, more strongly sclerotized laterally. Ductus bursae membranous, about twice width of antrum. Corpus bursae membranous, elongated, about five times the length of ductus bursae. Ductus seminalis from base of corpus bursae, about four times as long as corpus bursae.

Host plant. The host plant of *A. jobimi* is *Baccharis alnifolia* Meyen & Walp. (Asteraceae) (Figs 7, 8). Larval feeding and pupation of *A. jobimi* both occur in the inflorescences (Figs 9–11). This shrub has a narrow geographic range, restricted to the western slopes of the Andes between 3000 and 3800 m elevation in the northernmost part of Chile (Rodriguez et al. 2018) and southern Peru (Beltrán et al. 2006). A disjunct population is known from La Libertad Department, northern Peru (Beltrán et al. 2006).

Distribution. *Adaina jobimi* is known only from the type locality, about 2 km south of Socoroma village, at about 3400 m elevation on the western slopes of the Andes of northern Chile (Fig. 12).

Etymology. The name of the new species is dedicated to the memory of the great Brazilian musician Antônio Carlos Brasileiro de Almeida Jobim, best known as Tom Jobim, for his huge contribution to the development of the "Música Popular Brasileira" and his admiration of nature.

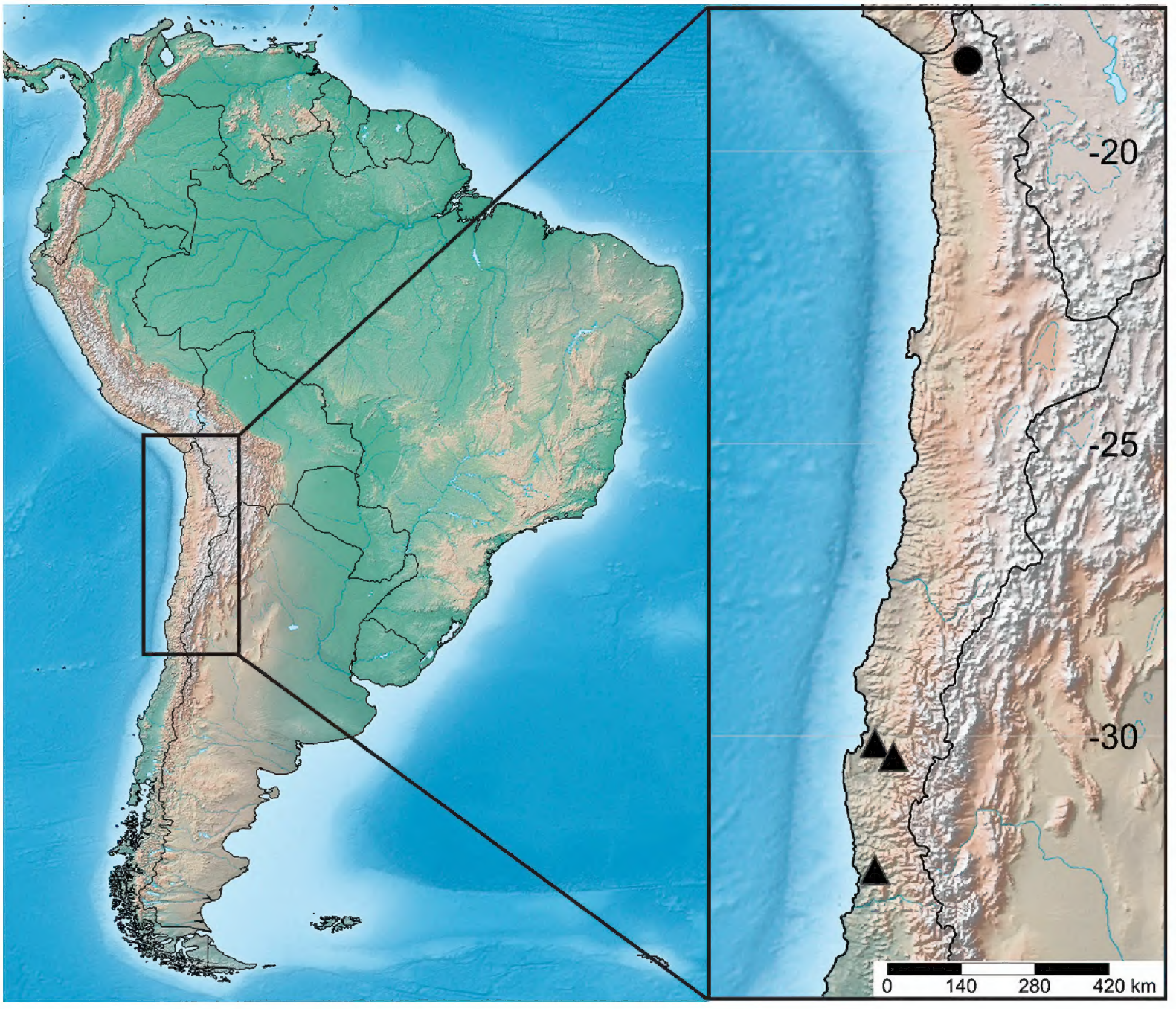

Figure 12. Geographic distribution of the species of *Adaina* in Chile: *A. jobimi* sp. nov. (circle) and *A. coquimboae* Gielis, 2012 (triangles).

Discussion

Many Neotropical species of *Adaina* were described in the last 30 years, either before (Gielis 1991, 1992; Landry et al. 2004; Bigot and Etienne 2009) or after (Gielis 2012, 2013, 2014) the revision of the Neotropical fauna by Gielis (2011a), suggesting that the taxonomic diversity of the genus in this region remains only partially known. The discovery of *A. jobimi* occurred in an area where few plume moth species have been recorded (Espinoza-Donoso et al. 2018; Vargas et al. 2020). Similar surveys for larvae on plants native to underexplored areas could be useful to collect additional species of *Adaina* and to know better the natural history and geographic ranges of the species already described.

The morphology of the saccular processes, juxta and cornuti in the male genitalia, and tergum VIII, ostium bursae and anterior apophyses in the female genitalia provide useful characters for species identification in *Adaina* (Gielis 1992, 2011; Landry et al. 2004; Matthews and Maharajh 2009). Although the differences in genitalia morphology between *A. excreta*, *A. coquimboae* and *A. jobimi* are relatively subtle, these are comparable to those found between other morphologically close species of *Adaina* (Matthews and Maharajh 2009), supporting the recognition of *A. jobimi* as a different species.

Adaina jobimi is the second member of the genus described from Chile. The only other Chilean representative, the endemic *A. coquimboae*, inhabits the lowlands of the north-central part of the country between about 30°S and 32°S, almost 1300 km south of the type locality of *A. jobimi*. Despite this long distance, *A. coquimboae* is geographically the nearest congeneric west of the Andes. The sampling gap between them certainly deserves further attention. *Adaina jobimi* is known only from the type locality. However, surveys throughout the geographic range of its host plant, *B. alnifolia*, in the mountain environments of northern Chile and southern Peru (Rodriguez et al. 2018), could reveal a wider geographic range for the new plume moth. As larvae of a single species of *Adaina* may be able to feed on different host plant species of Asteraceae (Landry et al. 2004; Matthews and Lott 2005), the possible presence of larvae of *A. jobimi* on inflorescences of other species of *Baccharis* and other genera of Asteraceae should be assessed.

Remarkable morphological differences have been described between larvae and pupae of external and internal feeder species of *Adaina* (Landry et al. 2004; Matthews 2006; Matthews and Maharajh 2009). Although the small number of specimens of *A. jobimi* collected and reared in this study impeded a detailed examination of its larvae and pupae, they show the morphological patterns typical of internal feeder species, like the gall-inducing *A. primulacea* Meyrick, 1929 (Matthews and Maharajh 2009), and the florivorous *A. simplicius* (Grossbeck) (Matthews 2006). However, the immature stages of *A. jobimi* must be described and illustrated in detail to enable solid comparisons with congenerics.

Finally, the discovery of *A. jobimi* represents the first record of the genus in a long distribution gap in mainland South America west of the Andes Range (between Ecuador and central Chile), and provides a new example of the overlooked diversity of micromoths associated with plants native to the arid environments of the western slopes of the Andes that deserves further attention.

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